March 5, 1935. C. N. JOHNSON ET AL 1,993,556

ROTARY DUPLICATOR

Filed March 16, 1932 3 Sheets-Sheet 1

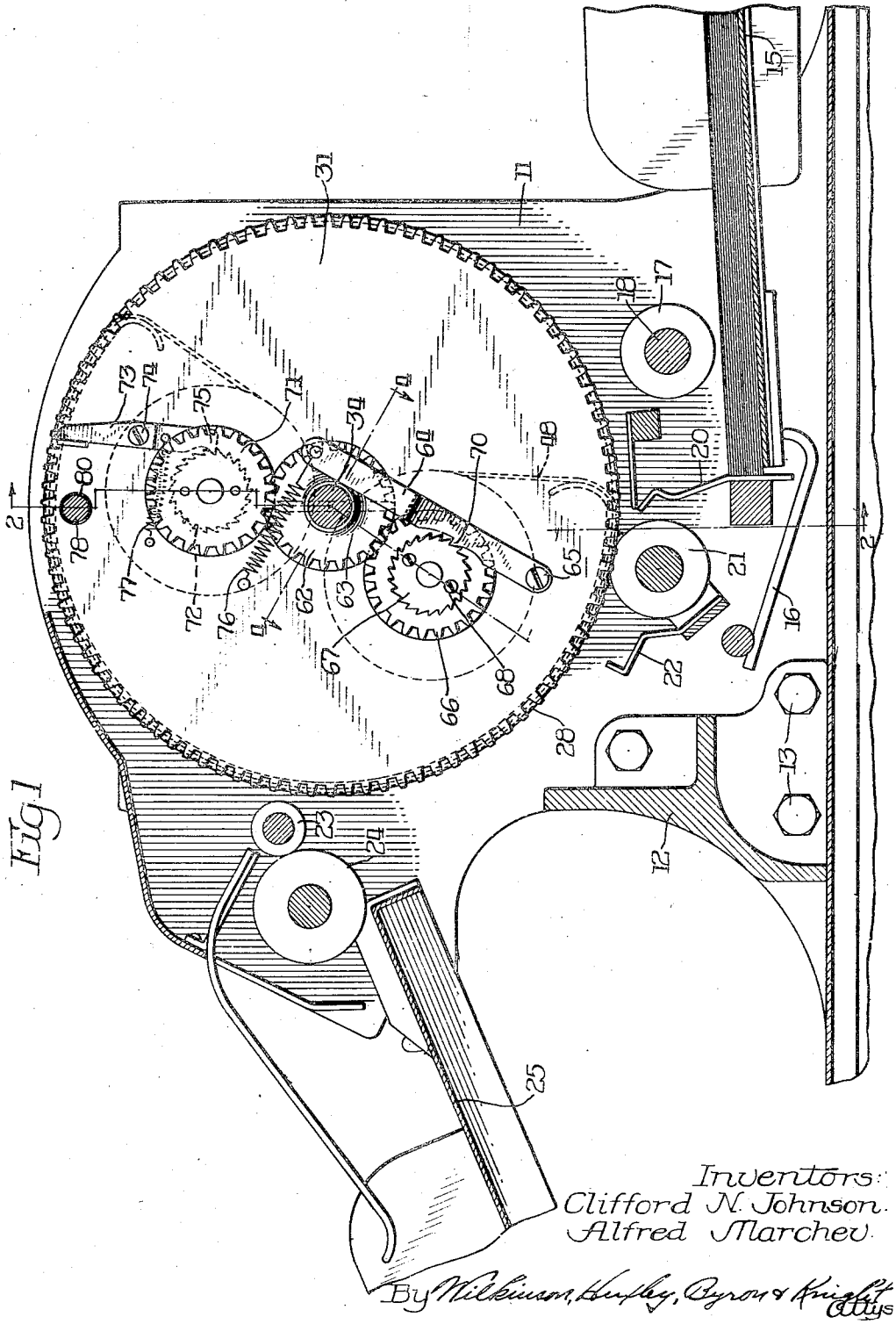


Fig 1

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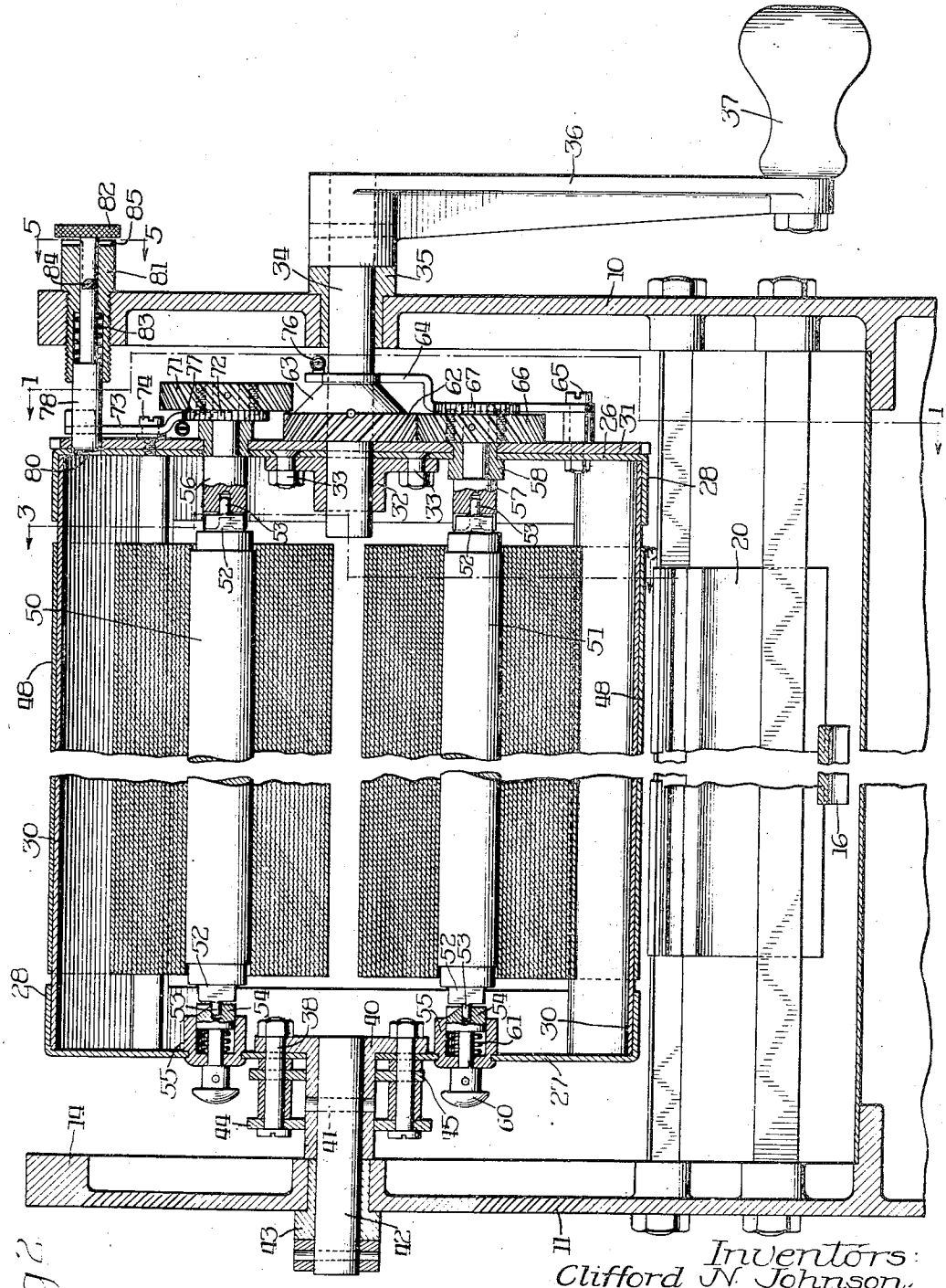


Fig 2.

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Fig 4.

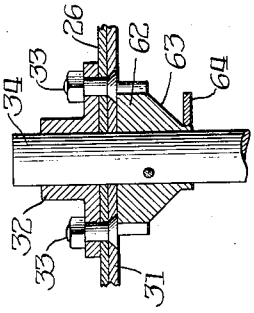


Fig 5.

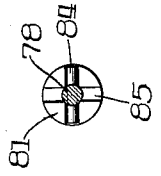
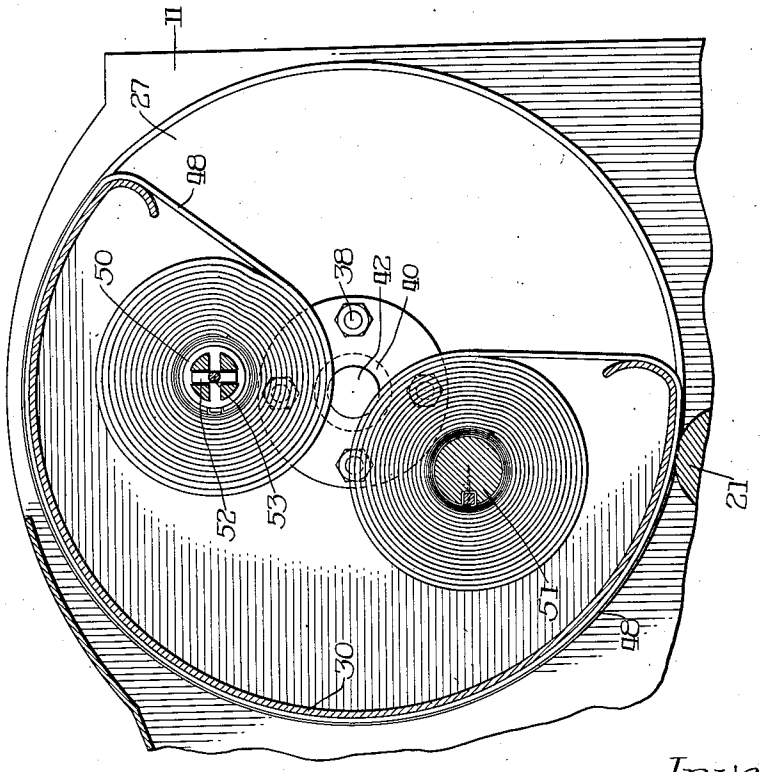


Fig 3.



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Patented Mar. 5, 1935 1,993,556

UNITED STATES PATENT OFFICE

1,993,556

ROTARY DUPLICATOR

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Application March 16, 1932, Serial No. 599,124

20 Claims. (Cl. 101—132)

The invention relates to rotary duplicators and more particularly is concerned with novel structure carried by the rotating drum for winding the gelatin band providing the duplicating surface for the drum.

The type of rotary duplicator with which the present invention is concerned has heretofore been equipped with a pair of spindles journalled in the drum at the respective ends of the printing bed or platen for winding the end portions of the gelatin band, the same being unwound from one spindle and wound upon the other with the platen supporting the section of the band in use. In the duplication of bills and similar class of work where a relatively small number of copies are required frequent stopping of the operation and actuation of the spindles is necessary in order to locate a clean surface of the gelatin band on the platen and considerable time has heretofore been consumed by the operator in releasing the spindles for rotation, rotating the same and again locking the spindles, the operation generally requiring the use of a separate tool. In order then to secure the highest operating efficiency it is imperative that the actuation of the spindles be accomplished with ease and that the acts required be reduced to a minimum, and it is to the attainment of these ends that the present invention is particularly directed.

Accordingly, an object of the invention is to provide a novel arrangement of elements for accomplishing the winding of the gelatin band and which will be actuated by the handle employed for rotating the drum, the construction including additional features whereby the band may be tightened and the spindles locked against inadvertent rotation.

A further object is to provide novel means for imparting selective rotation to a pair of spindles journalled in the drum of the duplicator for the purposes described which will include a central shaft forming the supporting and actuating means for the drum and wherein bodily shifting of the shaft in an axial direction will determine the spindle selected.

A further object is to provide a construction for rotating the spindles in the drum of a duplicator by means of the actuating handle for the drum, thereby rendering the handle capable of a dual function, the structure accomplishing the task of winding the gelatin band with ease and facility although employing relatively few parts which will not readily get out of order.

A still further object is the provision of a geared relation between a pair of spindles and a central rotatable shaft such that selective rotation of the spindles will take place, depending on the direction of rotation of the central shaft, a more specific object residing in the construction of the pinions, which will function to assist the operator in bringing the desired pinions into meshing rotation.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a longitudinal vertical sectional view of a duplicating machine of the rotary type showing the drum equipped with the mechanism of the present invention;

Figure 2 is a transverse vertical sectional view taken substantially through the center of the duplicator of Figure 1 as indicated by lines 2—2;

Figure 3 is a fragmentary vertical sectional view taken substantially along line 3—3 of Figure 2 and showing the manner of winding the ends of the gelatin band upon spindles;

Figure 4 is a detail sectional view taken on line 4—4 of Figure 1 and showing the constructional form of the center pinion; and

Figure 5 is a detail sectional view taken on line 5—5 of Figure 2 showing the means for retaining the pin in retracted position.

The duplicator shown in Figure 1 comprises a pair of spaced frame members 10 and 11 suitably mounted on a base and held in spaced relation principally by means of the center connecting member 12 bolted at 13 to the members. The members are provided with inwardly directed flanges 14 around their outer edges and have their inner opposed surfaces formed with a plurality of bosses which provide bearings for rotatably mounting within the frames the mechanism forming the duplicator. This latter consists essentially in a pivoted paper supporting tray 15, adjustably supported and actuated by means of member 16 so that the paper stock supported by the tray is brought into contact with a rotating feed roller 17 mounted on shaft 18 and operating to separate the top sheet through cooperation with the paper stop 20. The fed sheet is directed between the rotating drum and the rotatably mounted impression roller 21 and into contact with the margin bar 22 which at the moment is located in position for receiving and registering the leading edge of the sheet.

After the duplicating operation has been performed the leading edge of the sheet is pressed between the stripping rollers 23 and 24 which operate in a manner to strip the sheet from the duplicating surface and deposit the same upon the receiving tray 25 supported by the frame members in position for the purpose. Since the above structure is more fully disclosed in the co-pending application of James K. Duncan and Clifford N. Johnson, Serial No. 584,642, filed January 4, 1932, further discussion is considered unnecessary, since sufficient explanation of the manner of operation of rotary duplicators has been given to enable those skilled in the art to understand and appreciate the present invention.

As shown in Figure 2 the frame members 10 and 11 journal a rotary cylinder comprising spaced end members 26 and 27, each being formed with an inwardly directed flange 28 defining their peripheries and the flanges having secured thereto an arcuate plate 30 extending from points substantially diametrically of the cylinder and forming the printing bed. To the end member 26 is suitably secured a gear 31 for driving the impression roller 21 and a bearing 32, the latter being secured by bolts 33 centrally of the member and receiving the inwardly directed end of a supporting shaft 34 which in turn is journalled for rotation in bushing 35 positioned in the frame member 10. Arm 36 and handle 37 are secured to the outer end of shaft 34 and provides the means whereby the operator may rotate the shaft and the drum. For supporting the other end of the drum in frame member 11 the end member 27 has secured by bolts 38 centrally thereof a bearing 40 which is non-rotatably secured by pin 41 to shaft 42 journalled in bushing 43 positioned in the frame member. The bolts 38 also secure to end member 27 in spaced relation with each other and with the member a pair of cams 44 and 45 through which actuation is imparted to the paper supporting tray and margin bar in timed relation with the rotation of the drum.

The gelatin band 48 supported upon the arcuate plate 30 provides the duplicating surface for the drum and has its respective ends wound upon spindles 50 and 51 journalled in the drum. The spindles are of similar construction and are interchangeable, each being provided at their ends with flattened extensions 52 having a projecting pin 53. The spindles are supported for rotation within the drum by studs 54 mounted in bushings 55 positioned in the end member 27 and by shafts 56 and 57 rotatable in bearings 58 suitably secured in the end member 26, shaft 56 being recessed at its inner end for receiving the extension 52 on spindle 50, while shaft 57 is similarly recessed for supporting spindle 51. In order to permit removal of the spindles from the drum studs 54 can be withdrawn within bushings 55 by means of the knob 60 against the tension of the spring 61. When thus retracted the spindles are released from engagement with the studs and can therefore be withdrawn from engagement with their shafts 56 and 57, permitting their removal from the drum.

The invention is more particularly concerned with the provision of means for rotating the spindles so that the gelatin band can be wound upon one and unwound from the other when it is desired to present a clean portion of band upon the arcuate plate 30. Non-rotatably secured to shaft 34 is a pinion 62 having a cone portion 63, Figure 4, for engagement with arm 64 pivoted to end member 26 at 65. The pinion normally has meshing engagement with pinion 66 non-rotatably secured to the outer end of shaft 57 and which presents a ratchet 67 secured to its face by screws 68 for engagement by pawl 70 formed on the arm 64. The pinions are provided with teeth of spiral construction and from the description given it will be understood that upon rotation of shaft 34 in a clockwise direction the pinion 62 will rotate pinion 66 and spindle 51 to wind the gelatin band thereon.

Non-rotatably secured to the outer end of shaft 56 is a spiral pinion 71 having suitably secured to its inner face the ratchet 72. A manually operated lever 73 is pivoted to end member 26 at 74 and provides a pawl 75 for engaging with the ratchet 72. The coil spring 76 maintains the arm 64 in position where the same engages the cone 63 in which position pawl 70 is in engagement with the ratchet 67. In a similar manner coil spring 77 maintains the arm 73 in position where pawl 75 engages the ratchet 72. Before rotation of the spindles can be effectively accomplished the drum must be locked against rotation and accordingly the pin 78 is released for location in aperture 80 in the drum. Member 81, threaded in the frame member 10, receives the pin 78 and the knob 82 secured thereto in a manner to permit the operator to retract the pin against the tension of the coil spring 83 and by locating the studs 84 in grooves 85 the pin can be held in retracted position and released when desired.

From the foregoing it will be understood that when the operator desires to wind the gelatin band upon spindle 51 it will be first necessary to lock the drum against rotation by means of pins 78 and rotate shaft 34 in a clockwise direction, Figure 1, first releasing, however, pawl 75 from engagement with ratchet 72 in order that the band may unwind from spindle 50. To tighten the band upon the printing bed after a clean portion has been suitably located thereon it is only necessary to release arm 73 allowing pawl 75 to again engage the ratchet, thus locking spindle 50 against rotation. Accordingly, continued rotation of spindle 51 will tighten that portion of the band on the printing bed. It will be noted that during rotation of spindle 51 pawl 70 is continuously in engagement with ratchet 67, and thus the same can only rotate in a direction to wind the band thereon. For winding the band upon the drum 50 the shaft 34 is rotated in a counter-clockwise direction and by reason of the spiral construction of the pinion teeth and since pinion 66 can not rotate in a clockwise direction the pinion 62 will be bodily moved, moving shaft 34 axially in a direction toward the right, Figure 2. This shifting of the pinion and shaft functions to mesh pinion 62 with 71 and to cause arm 64 through contact with the arm by the cone portion 63 to rock, releasing engagement of pawl 70 with pinion 67. Continued rotation of shaft 34 counter-clockwise will rotate pinion 71 and the spindle 50 connected thereto to wind thereon the gelatin band, and since pinion 51 is released for rotation the band is free to unwind therefrom. The operation required to tighten the band upon the printing bed is in this case entirely automatic, it being only necessary to rotate shaft 34 clockwise, the rotation disengaging pinions 62 and 71 and causing pinion 62 to mesh with 66, rotating pinion 51 causing the slack portion of the band to be wound thereon.

By eliminating the shaft extending through the drum increased space is available for the convolutions of the band on the spindles so that greater length of band can be carried by the drum. The invention permits, however, if desired, the use of a single shaft as the same would operate in the manner as described with reference to shaft 34, which, in the embodiment disclosed, journals only one end member of the drum. It will be appreciated that the present structure is relatively simple as the parts employed have been reduced to a minimum and although the utility of the handle has been increased its primary function of rotating the drum for performing duplicating operations has not been destroyed or altered in any manner.

By the arrangement of the parts in a manner for convenient and ready actuation by the central shaft there is provided means for winding the band wherein the minimum of time will be consumed as the handle is convenient and is the instrument most desired since it eliminates additional structure. The change from the operation of rotating the drum to that of rotating the spindles is easily effected since after the drum has been locked the lever 73 is in position for releasing the spindle 50 should it be desired to unwind the band from that spindle and when the band is to be wound thereon the operation is automatic only requiring movement of the shaft toward the right to bodily shift the pinion 62 and by reason of the spiral construction of the pinion teeth meshing of the pinions is facilitated. This latter feature is particularly desirable as it enhances the efficiency of the structure when the pinions must be quickly engaged or disengaged for tightening the band.

It is to be understood that we do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

We claim:

1. A rotary duplicator including frame members, shafts journalled therein and rotatably mounting a cylinder, a plurality of spindles carried by the cylinder and having the ends of a band wound thereon, a crank arm secured to one shaft and providing means for rotating the cylinder, said latter shaft being rotatable independently of the cylinder for actuating the spindles to wind or unwind the band therefrom.

2. A duplicator including a drum mounted for rotation in frame members, spindles rotatably carried by the drum for winding the ends of a duplicating band thereon, a member mounted for rotation and for slidable movement, and means for connecting the member with each spindle, the spindle connected being determined by slidable movement of the member.

3. A duplicator including a drum mounted for rotation in frame members, spindles rotatably carried by the drum for winding the ends of a duplicating band thereon, a shaft rotatable in one frame member and serving as part of the journalling means for the drum, said shaft being movable in an axial direction, and means for operatively connecting the shaft with each spindle to rotate a spindle upon rotation of the shaft, said selected spindle being determined by axial movement of the shaft.

4. A duplicator including frame members journalling a drum, a shaft rotatable in one member and forming part of the journalling means, spindles carried by the drum for winding the ends of a duplicating band thereon, and means for selectively rotating the spindles including a pinion suitably connected with each spindle and a pinion adapted to mesh therewith mounted on said shaft, the meshing of desired pinions being accomplished by movement of the shaft in an axial direction.

5. A duplicator including frame members, a shaft journalled in the members for supporting a drum, a pair of spindles detachably carried by the drum and mounted for rotation, said spindles having the ends of a duplicating band wound thereon, a pinion associated with each spindle, a locking member preventing rotation of the spindles in one direction, a pinion positioned on the shaft and having axial movement with the shaft to selectively mesh with the first mentioned pinions, said movement occurring by rotation of the shaft in a certain direction when the pinion in mesh is locked against rotation.

6. A duplicator including a drum mounted in frame members, a shaft in each frame and having association with its adjacent end member of the drum for rotatably supporting the drum, a duplicating band on the drum, spindles carried by the drum for winding the ends of the band thereon, means on one of said shafts for actuating the spindles upon rotation thereof, and means for positively locking the drum during actuation of the spindles.

7. A duplicator including a drum mounted in frame members, a shaft in each frame for rotatably supporting its adjacent end member of the drum, a duplicating band on the drum, spindles carried by the drum for winding the ends of the band thereon, means locking each spindle against rotation in one direction, means on one of said shafts for rotating the spindles, said last mentioned means being operative to automatically release one locking means when rendered operative for rotating the other spindle.

8. A duplicator including a drum mounted in frame members, a shaft in each frame for rotatably supporting its adjacent end member of the drum, a duplicating band on the drum, spindles carried by the drum for winding the ends of the band thereon, a member for locking each spindle against rotation in one direction, a pinion having a cam portion mounted on one of said shafts and being axially movable to selectively rotate the spindles, said cam portion serving to release one locking member upon axial movement of the shaft in a certain direction and to return the member to locking position upon movement of the shaft in the opposite direction.

9. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by said cylinder, a duplicating band having its ends wound on said spindles, and means including a crank arm movable longitudinally of said cylinder for selectively driving said spindles.

10. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around the spindles, a member rotatably and slidably mounted on the cylinder, and means carried by said cylinder and actuated by said member for selectively driving said spindles.

11. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a

duplicating band having its ends wound around the spindles, spiral gears constrained to rotate with said spindles, a member rotatable with respect to said cylinder and movable longitudinally thereof, a third spiral gear carried by said member and selectively engageable with said spiral gears on said spindles, and pawl and ratchet means for holding said spindles against rotation in predetermined directions.

12. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around the spindles, spiral gears operatively connected to said spindles, a third spiral gear slidably and rotatably journaled on said cylinder and selectively engageable with the spiral gears operatively connected to said spindles, and means carried by said cylinder for preventing rotation of said spindles in predetermined directions.

13. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around the spindles, a slidably mounted member for rotating said cylinder, and means actuated by said member for selectively rotating said spindles.

14. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around the spindles, a member for rotating said cylinder, and means actuated by said member for selectively rotating said spindles, said means being responsive to a change in the direction of rotation of said member.

15. A rotary duplicator comprising a frame, a duplicating cylinder journaled in the frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound on said spindles, means for rotating said cylinder, and means actuated by said rotating means for rotating one of the spindles while the duplicating cylinder remains stationary.

16. A rotary duplicator comprising a frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around said spindles, gears operatively connected to said spindles, means for rotating said duplicating cylinder, and means actuated by said rotating means for selectively rotating the gears and spindles while said duplicating cylinder remains stationary.

17. A rotary duplicator comprising a frame, a duplicating cylinder journaled in the frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around said spindles, means for rotating said cylinder, means for locking said cylinder against rotation, and means actuated by said rotating means for rotating one of said spindles while said cylinder is locked against rotation.

18. A rotary duplicator comprising a frame, a duplicating cylinder journaled in said frame, a plurality of spindles carried by the cylinder, a duplicating band having its ends wound around said spindles, means for locking said cylinder against rotation, means for rotating said cylinder, and means including a plurality of gears actuated by said rotating means for rotating one of said spindles while said cylinder is locked against rotation.

19. In a duplicating machine, a frame, a duplicating drum journaled in the frame, means for rotating said drum, a pair of spindles rotatably journaled in said drum, a duplicating band extending from one of said spindles over a portion of said drum to the other spindle, means for driving one of said spindles to advance said band, and means locking said band advancing means against operation while the drum is rotating.

20. In a duplicating machine, a frame, a duplicating drum, a platen roller cooperating with said drum, means for causing a printing movement between said drum and said platen roller, a pair of spindles rotatably journaled in said drum, a duplicating band extending from one of said spindles over a portion of said drum to the other of said spindles, means for rotating one of said spindles to advance said band, and means for locking said band advancing means against operation while said drum and said platen roller are cooperating in a printing movement.

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